tion is rather small, but is valuable for forecasting purposes, as it enables one to come closer to actual yield than is possible using the average yield.

The use of these computed yields as a base for combination with the yields computed from the temperature data is following the method outlined by J. B. Kincer.[3] The yields computed from the rainfall data are called Yr and those from temperature Yt. Thus, the correlation coefficient, $rYtYrx = 0.87$. This is an increase of 6 points over that obtained only from temperatures and gives a reduction of the standard deviation of 51 per cent, an increase of 10 per cent over that from temperatures alone.

It is not well to stop here, however, as some other combination of weeks might raise the coefficient. A small increase at these high values is very important, so it is worth while to try other combinations.

Thus, dropping the first week used, June 14, and combining the remaining weeks, gives a coefficient of 0.63, one point less than for the whole six weeks. It would appear that these weeks would not give such a high coefficient as the entire six, but the intercorrelation coefficient is only 0.39, against 0.46 for the whole period. The multiple coefficient is 0.88 against 0.87, or an increase of one point, a valuable increase, as there is a 2 per cent further reduction in standard deviation, bringing it to 53 per cent. The equation for computing yields from these latter variables was:

$$\overline{X} = 0.58\ Yr + 0.80\ Yt - 3.93$$

Figure 1, shows the computed and actual yields for 1901–1925. The agreement is remarkably close, considering the range of the data, although a few years are still somewhat at variance with the actual yields.

[3] Kincer, J. B., and Mattice, W. A. (1928): Statistical Correlations of Weather Influence on Crop Yields. MONTHLY WEATHER REVIEW, 56, 2.

The standard deviation of computed from actual yields is 1.92, compared with the standard deviation of yield, 4.05; the reduction is 53 per cent, as before stated.

The period of two weeks ending with July 12 was also correlated with temperature and yield and produced a coefficient of 0.85, or only three points less than with the five periods and two less than with all six weeks. This, in itself indicates that the period from June 29–July 12 is a critical one for precipitation, although the other periods are of some slight importance.

Some other combinations were tried in order to exhaust all possibilities, but there was none that gave as satisfactory a result as that for five weeks.

The conclusions that can be drawn from the above statements are that temperatures are of major importance in the yield of apples, on a State basis, and that precipitation is only of secondary importance. These conclusions are possible only to State yields and can not be applied to single orchards, as demonstrated in the conclusions obtained by R. C. Collison.

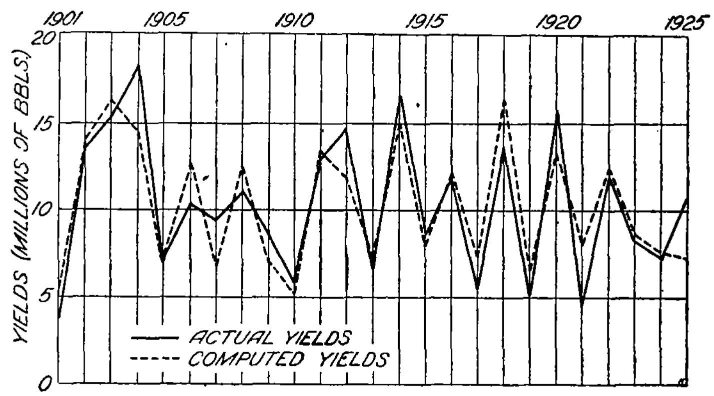

FIGURE. 1—Actual and computed yields of apples, New York State

EFFECT OF OZONE ON THE TEMPERATURE OF THE UPPER AIR

By EDWARD H. GOWAN

Two papers have been recently published by this author.[1]

The following abstracts are reprinted from Science Abstracts 32; 430 (1929) and 34: 58 (1931).

The illustrations are from the original papers.

The paper deals with the radiative equilibrium of the upper part of the atmosphere, taking into account the effects, with selective absorption, of water vapor and ozone. For material the author used (1) Abbot's curve for the distribution of energy in the solar spectrum from 0.4μ to 1.2μ and a black-body curve for 6,200° K. for 1.2μ to 6μ; (2) average radiation as for a black body at 260° K. from the earth and a moisture-laden atmosphere below 11 kilometers; (3) the amount of O_3 as constant and equal to a thickness of 3 millimeters at N. T. P. with a center of gravity at 30 to 40 kilometers; (4) a smooth average curve for absorption of O_3; (5) Fowle's figures for the absorption of H_2O vapor; and (6) saturation at 11 kilometers for 219° K. for H_2O vapour. Curves show the results obtained for temperature and height for (1) absorption and radiation due to H_2O vapor alone; (2) the observed amount of O_3 distributed as for O_2 down to 40 kilometers; and (3) an assumption of a change in distribution of O_3 to keep the temperature at 300° K. up to 150 kilometers. The effects on the temperature of (1) a different H_2O vapor distribution; (2) variation of absorption with temperature and pressure; and (3) a change in the center of gravity of the O_3 are discussed. The final temperature distribution arrived at agrees well with sound ranging and meteor observations.—*R. S. R.*

58. Effect of Ozone on the Temperature of the Upper Atmosphere, Part II, E. H. Gowan. Roy. Soc., Proc. 128, pp. 531–550, August 5, 1930. The method described in an earlier paper (see Abstract 430 (1929) is rendered more easy of solution by certain assumptions and allowance is made for diffusion of radiation from the earth. Preliminary estimates of the rate of cooling of the upper layers of the stratosphere and consideration of independent observational evidence of meteors lead to the belief that mixing of the constituents is general far above the tropopause. The radiation from the stratosphere must then be less and since the absorption of solar energy is the same, higher temperatures result. The maximum temperature attainable is investigated, this being governed by the rate of thermal decomposition of ozone and the rate at which ozone is formed in the atmosphere. The assumption of radiative equilibrium is reexamined in relation to convection being sufficient to insure mixing and the idea is retained. The effect of water vapor distributions for (*a*) no convection and gases in gravitational equilibrium, and (*b*) enough convection to give a constant composition is illustrated by calculations for varying conditions. The effects of different distributions and amounts of ozone and different zenithal angles of the sun are similarly treated. It is concluded that plausible distributions of ozone and water vapor provide the basis for a quantitative explanation of sound wave and meteor phenomena.—*R. S. R.*

[1] Proc. Roy. Soc. London A 120:655 (1928) and A 128:531 (1930), the second paper being an extension of the first.

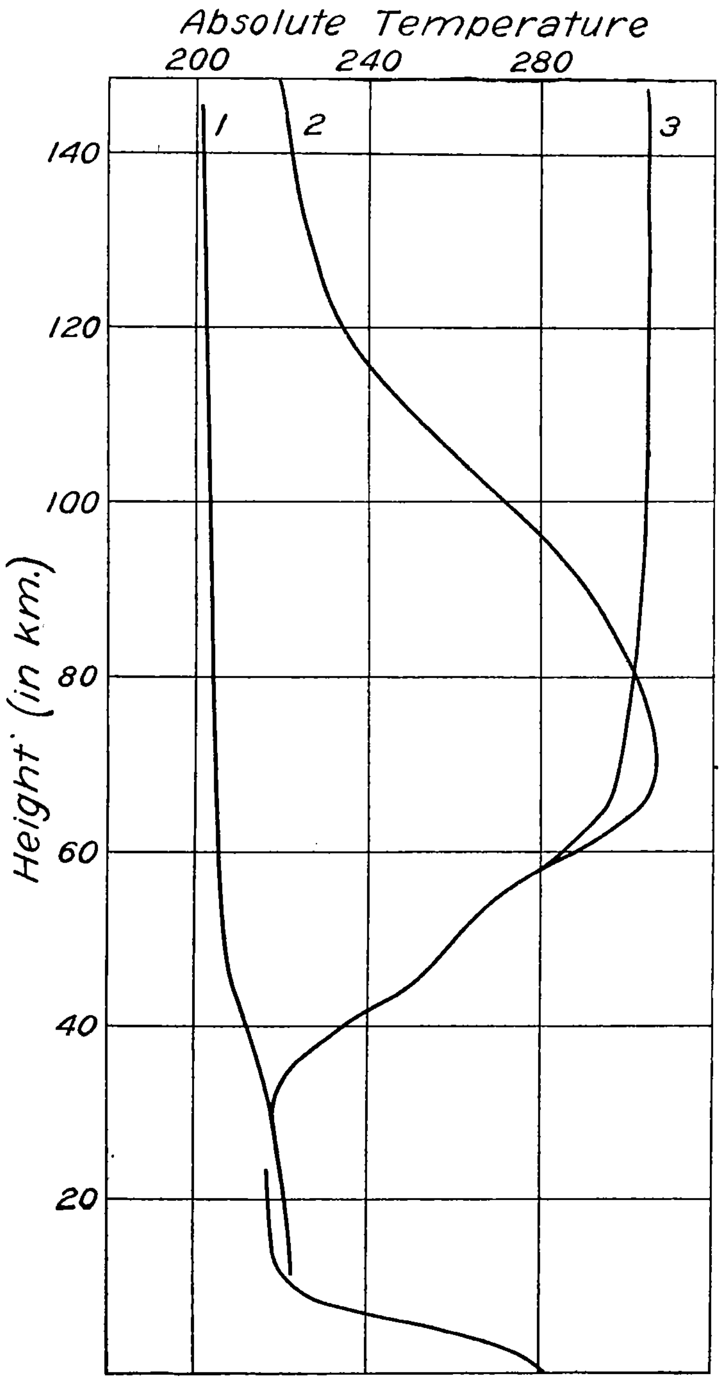

FIGURE 1.—Curve 1 shows an average of the balloon observations given by Sir Napier Shaw in Part II of his Manual of Meteorology. Curve 2 was obtained by considering the absorption and radiation of water vapor alone. The curve was intended for use as a basis of comparison. Curve 3 is the result when the observed amount of ozone is distributed so as to be proportional to the oxygen down to 40 kilometers. From 30 to 40 there is the same amount as in the layer from 50 to 60, and below that no appreciable amount is assumed

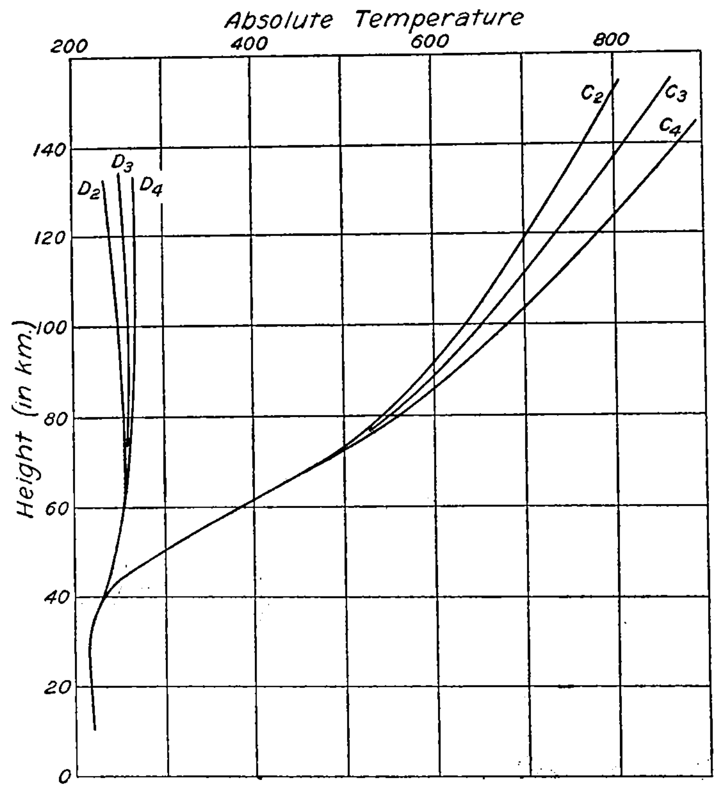

FIGURE 2.—Effect of variations in amount of ozone, distribution B. D-family: Water vapor distribution A. C-family: Water-vapor distribution B. Subscripts 2, 3, 4 represent total amount of ozone, millimeters

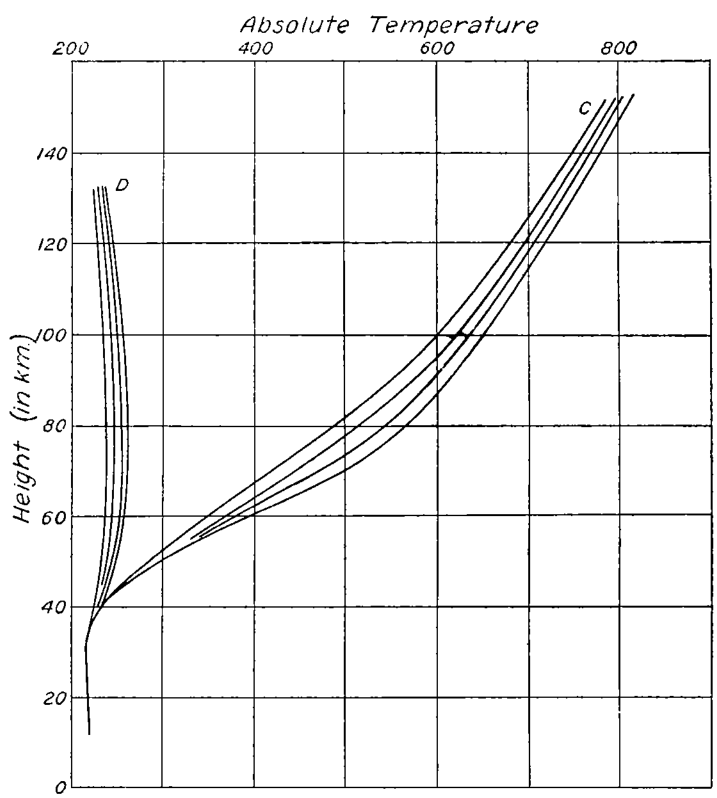

FIGURE 3.—Effect of zenith angle of the sun. Ozone distribution B for 2 millimeters total. D-family: water vapor distribution A. C-family: Water-vapor distribution B. From right to left the curves are for zenith angles of 0°, 28°, 48°, and 60°.